

per cent, were one-half verified; 347, or 9.30 per cent, were three-fourths verified; 2,784, or 74.62 per cent, were fully verified, so far as can be ascertained from the tri-daily reports.

Cautionary Signals.—Thirty-five Cautionary signals were displayed during the month, of which 29, or 82.86 per cent., were fully justified by winds of twenty-five miles per hour or over, at or within a radius of 100 miles of the station. No Off-shore signals were displayed. The above does not include signals ordered at display stations where the velocity is only estimated; one hundred and three winds of twenty-five miles or over were reported, for which no signals were ordered. Six signals were ordered late.

NAVIGATION.

Stage of Water in Rivers.—In the table on the right hand side of chart No. III are given the highest and lowest stages of water, as observed at Signal Service river gauges during the month of July, 1881. At no time during the month were rivers above the danger line at any of the various stations. The highest water in the Red, Arkansas and Mississippi rivers was reached between the 3d and 4th; in the Mississippi river between the 1st and 18th; in the Ohio, Cumberland and Tennessee rivers between the 1st and 6th; in the Monongahela on the 23d and 24th, and in the Willamette, at Portland, Oregon, on the 1st.

Floods due to unusually heavy rains were particularly destructive to crops and other property in the northern portion of the Upper Mississippi valley, being most severe in those portions of the states of Illinois, Iowa, Wisconsin and Minnesota bordering the Mississippi river. *California.*—San Geronimo, 4th, heaviest rain storm in 7 years; mountain streams turned into rushing torrents, washing out field crops and fruit trees. *Colorado.*—Denver, 30th, very heavy rains, flooding all streams and causing damage estimated at \$50,000 to streets, stores and cellars. *Iowa.*—Carroll, Carroll Co., 13th, heaviest rain storm ever known in this state; 12 inches (estimated) fell in three hours; creeks and rivers overflowed and all bridges for miles were carried away, roads impassable and all communication cut off. Cedar Rapids, 13th, the destruction of railroad, farm and city property immediately west of here by heavy rains is unparalleled in the history of this region. The railroad companies were the greatest sufferers, a very large number of valuable bridges and culverts being washed out and many miles of track ruined. Marengo, 13th, river highest ever known; public square two feet under water and boats were propelled through the streets without difficulty; several large flouring and woolen mills flooded; court-house, post-office and a large number of business houses flooded; entire damage estimated at \$500,000. Waukegan, 11th, heavy washout on the Des Moines and Northwestern R. R. Leighton, 11th, between this station and Pella, track badly damaged and bridge carried away. Marshalltown, 11th, water four feet deep in the town, great damage to property. Colfax, 11th, water rose above the flat cars standing near the depot; tracks badly washed; communication cut off. Kellogg, 11th, from this town to Wilton railroad track badly washed; farming lands submerged; Raccoon and Des Moines rivers rising rapidly, cutting the levees badly. Bentonsport, 15th, Des Moines river, 12½ feet above low water mark, a rise of 32 inches in about twelve hours. Ottumwa, 15th, Des Moines river highest for years. Brighton, 15th, Skunk river overflowed; railroad bridge badly damaged. Des Moines, 11th, river at flood tide; several hundred yards of railroad track washed away; 15th, water much higher, inundating the first story of the flouring mill; the brick and saw mills completely surrounded; lower portion of city near Walnut street submerged; people deserted their homes; several narrow escapes; Raccoon river overflowed, backing up the Des Moines river, so as to submerge the western portion of city to the depth of four feet; lowlands to the southwest of city submerged, driving out the stock. Keokuk, 13th, Des Moines River, very high, damaging railroad bridge, 3 miles below station; 15th, river rose at the rate of 1½ inches per hour; 16th, full of heavy driftwood, track of the Keokuk and St. Louis R. R. submerged; 18th, river stationary at 22 inches above the danger-line; bottom lands below Alexandria overflowed and trains on the Keokuk and St. Louis R. R. stopped; 19th, river falling slowly. *Wisconsin.*—Salem, 21st, the La Crosse division of the Milwaukee and St. Paul Railroad badly washed in many places, delaying all trains. La Crosse, 21st, immense damage in surrounding country; all rivers and creeks above their banks; in the city, basements were flooded, in many cases entailing great loss; streets were very badly washed, in some cases to the depth of 12 or 15 feet. Chaseburg, Vernon Co. 21st, water four feet higher than ever known before; great amount of damage done to buildings, bridges and crops. Coon Valley, 21st, water highest ever known; seven persons drowned; bridges all gone, roads impassable and all communication cut off. Winona Junction, 21st, 700 feet of the Chicago, Milwaukee and St. Paul Railroad washed out; heaviest rain storm for years. Campbell, 21st, bridges washed away; roads almost impassable. Bostick Valley, Vernon Co., 21st, bridges and dams entirely gone; over 500 tons of hay carried away by the rushing torrent of water; loss to farmers exceedingly severe in several instances reaching \$1000 to a single proprietor. In the townships of Webster, Liberty and Kickapoo, nearly every bridge was swept away; at Bloomington and Avalanche the bridges, although

very substantial structures, could not withstand the terrible force of the flood. Reports from Springville, Vernon Co., show that the crops are completely ruined, and on the lowlands everything is several feet under water. At Kickapoo Centre and Readstown, highest water ever known; crops in a terrible condition. *Indiana*.—Ft. Wayne, 21st, heaviest rain storm for years; 35 feet of canal bank washed out in eastern part of city, and great damage done by the overflow of water. Between this city and Abbot aqueduct, five miles west, five breaks were reported; dangerous washouts on the Ft. Wayne and Jackson Railroad and on the Wabash Railroad; several new buildings in process of construction badly damaged. Goshen, 21st, all trains on the Air-Line Division of Lake Shore Railroad delayed on account of heavy washouts; heaviest rain storm for many years. New Paris, 21st, railroad tracks washed out; much damage to farm crops. Elkhart, 21st, all streams overflowed; heavy washouts on highways and railroad tracks. *New Mexico*.—Silver City, 22nd; in consequence of heavy rains, mountain streams were greatly swollen, flooding some of the principal streets to a depth of two feet; 25th, mountain streams again overflowed; 28th, streams again overflowed, badly washing streets and destroying considerable property. *New York*.—Dresden, 21st, heavy washout on the Delaware and Hudson Railroad, one passenger train wrecked. *Illinois*.—Waukegan, 21st, severest rain storm for years; roads impassable; fields flooded. *Michigan*.—Coldwater, 21st, terrible storm of wind and rain; hundreds of acres inundated in various parts of the county; large amount of hay and wheat ruined.

Drought.—*Alabama*, Selma, 15th, gardens and farm crops drying up. Montgomery, 15th, on several plantations in the surrounding country, the entire corn crop has been cut down to save the fodder, as the protracted drought has prevented it from developing. *Arkansas*.—In the northern part of the state no rain fell during the first half of the month; early corn badly damaged, other crops not seriously. *Illinois*.—Anna, 15th, crops suffering, wells, cisterns, ponds and creeks drying up. In the northern portion of the state, and especially in the oat section about Galena, drought has been very severe; the oat crop is a failure, and wheat will make about half a crop. Cairo, 15th, ground parched and vegetation drying up. Springfield, 15th, crops suffering. *Indiana*.—Vevay, 28th, crops and orchards suffering for want of rain; St. Meinrad, 16th, corn crop suffering. *Indian Territory*.—Cantonment, 11th, vegetables and field crops ruined; Ft. Gibson, crops suffering severely. *Georgia*.—In many localities in the interior and northern portions of the state, the corn crop is entirely lost, and garden crops have suffered severely. *Kansas*.—Independence, 30th, very dry, crops suffering; Clay Center, 28th, crops suffering. *Louisiana*.—Assumption Parish, 15th, corn and rice crops suffering severely; Calcasieu Parish, 15th, all crops suffering from want of rain, corn, cane and cotton, badly damaged; Catahoula Parish, 15th, corn and cotton suffering severely, the weather has been so hot, that, to a considerable degree, regular farm labor has been suspended; East Carroll Parish, 15th, corn crop greatly injured, cotton will harvest but half a crop; Lafayette Parish, 15th, corn and potatoes badly damaged and peas will harvest but half a crop; Ouachita Parish, 15th, corn will not harvest one fourth of the crop, and fodder is nearly all burned up; In Lafourche, Lincoln Rapides, and St. John Parishes, 15th, the corn crop has suffered severely and vegetables are badly damaged. *Missouri*.—The Missouri State Weather Service reports: that the whole state has suffered from severe drought during the month; in the eastern and southeastern part of the state wells and creeks have dried up and vegetation has suffered severely; the ground was parched and dusty and the corn crop has been damaged to such an extent, not only in this section, but throughout the state, that hardly one-half of the usual crop will be harvested. Oregon, 30th, very dry, crops suffering. *Michigan*.—Litchfield, first part of month very dry, crops severely injured; Thornville, 15th, very dry; Port Huron, 17th, crops suffering severely. *Mississippi*.—In the central portion of the state corn and oats have suffered severely, and cotton has been more or less damaged in several counties. *North Carolina*.—Highlands, month very dry, crops suffering. *Ohio*.—Bethel, month very dry, crops suffering, fruit very poor; College Hill, month very dry, vegetation suffering; North Lewisburg, 1st to 20th, greatest drought ever experienced in this section. *Nebraska*.—Howard, very dry, crops suffering. *Pennsylvania*.—Milton, during former part of month, drought very severe, injuring crops badly. *South Carolina*.—Darlington, throughout the neighboring country, crops suffered during the first half of month. Barnwell Co., 30th, the winds for the past two weeks have been very hot and dry and the corn crop is a complete failure; Clarendon Co., corn will average about half a crop, and cotton about three-fourths of a crop. Williams Co., 30th, drought still prevailing, and is unprecedented in the annals of this county. Orangeburg Co., corn falling down in fields, compelling the farmers to harvest it as forage; driest weather for many years. Anderson Co., in the southern portion, crops literally ruined, the upland corn is dead, and cotton has shed nearly all of the little fruit it had. Marion Co., 30th, corn will average from one fourth to half a crop. Sumter Co., 30th, corn and cotton crops badly damaged. *Tennessee*.—Ashwood, 30th, no rain for 33 days; Nashville, 30th, most severe ever known, far more destructive than the great drought of 1854; corn crop a complete failure. In some parts of western Tennessee, no rain has fallen since the last three days of June; cotton crop suffering greatly, farmers cutting down corn to save it for fodder; wells and streams dry, and people as well as animals are really suffering; in some cases, people are hauling drinking water a distance of several miles. The earth is baked, and roadways are powdered to a depth of 6 inches. Chattanooga, 30th, crops suffering severely. Memphis, 30th, crops suffering severely.

Texas.—Clarksville, 30th, crops suffering badly. In the counties of Atascosa, Arkansas, Bexar, Comanche, Fannin, Sabine, Hopkins, Henderson and Hunt, during the first part of month, crops suffered severely. Corsicana, 30th, month very dry, vegetation badly damaged. Indianola, 7th, cisterns empty, streams very low. *Virginia*.—Wythville, 30th, cisterns and streams drying up, crops suffering. Lynchburg, 12th, small streams completely dried up, and even wells fail to meet their purpose; cattle have to be driven, in some instances, as far as 6 miles for water, crops suffering badly.

Waterspouts.—Somerset, Mass., 21st, 3.15 p. m., two waterspouts observed on Taunton river. Lake George, Fla., 14th, two heavy squalls from opposite directions, met squarely in the lake in front of the observer's place, producing a terrible whirl, the water immediately rising from the centre of the whirl, forming a long column, reaching from the clouds to the lake, and having the form of an hour-glass. It traveled some distance and as the whirl subsided, broke in two in the middle, the upper part ascending and mingling with the clouds, and the lower part falling into the lake with a splash.

TEMPERATURE OF WATER.

The Temperature of Water, as observed in rivers and harbors at Signal Service stations, with the average depth at which observations were taken, is given in the table on the left-hand side of chart No. III. Daily observations for the entire month were made at all stations, except at Escanaba, where they are wanting from the 5th to the 11th, inclusive.

ATMOSPHERIC ELECTRICITY.

Thunder Storms.—In the various districts they were reported on the following dates: New England, 1st to 4th, 5th, 10th to 18th, 20th, 21st, 23rd to 29th. Middle Atlantic states, 1st, 3rd, 4th to 7th, 11th to 14th, 16th, 19th to 23rd, 25th, 26th to 31st. South Atlantic states, 1st, 2nd, 8th to 15th, 17th to 23rd, 25th to 28th, 30th 31st. Florida, 1st to 3rd, 10th to 24th, 27th to 31st. Eastern Gulf states, 1st, 2nd, 9th to 14th, 17th, 18th, 23rd, 25th to 28th. Western Gulf states, (including Texas) 1st, 2nd, 3rd, 4th, 6th 9th, 10th, 12th to 18th, 21st, 22nd, 24th, 25th, 29th. Ohio valley and Tennessee, 6th to 17th, 21st, 22nd, 25th, 27th to 30th. Lower Lake region, 5th, 6th, 7th, 8th, 10th, 12th, 13th, 16th, 18th, 20th, 21st, 25th, 27th, 29th to 31st. Upper Lake region, 4th to 10th, 12th, 13th, 15th, 16th 20th to 25th. Upper Mississippi valley, 2nd, 6th to 17th, 20th, 21st, 24th. Lower Missouri valley, 6th to 17th, 19th, 20th, 22nd to 25th, 29th. Southern Slope, 1st, 2nd, 8th, 10th, 11th, 14th to 17th, 19th, 24th to 31st. Middle Slope, 2nd, 4th, 5th, 6th, 8th, 10th, 12th, 13th, 20th, 21st, 22nd, 25th, 29th. Northern Slope, 1st, 2nd, 9th, 11th, 13th, 14th, 16th to 20th, 23rd, 25th, 30th. Southern Plateau, 3rd to 8th, 10th, 11th, 14th, 16th to 26th, 27th, 30th. Middle Plateau, 1st, 2nd, 10th, 15th to 19th, 25th, 27th. Northern Plateau, 2nd, 3rd, 9th, 11th 13th, 18th, 19th, 23rd, 24th, 26th to 28th. Southern Pacific coast region, 3rd, 25th. Middle Pacific coast region, 4th. Northern Pacific coast region, 18th, 23rd, 30th, 31st.

The following items of interest connected with the peculiar manifestations of electricity during the progress of thunder storms were obtained from various sources: La Crosse, 21st, church spire demolished, six or seven houses badly damaged and a number of barns burned. Oakland, Wis., 21st, several buildings struck and burned. Port Washington, Wis., 21st, three boys, while crossing a bridge at a rapid gait, and elbow to elbow, were enveloped by a flash of lightning, instantly killing the two outside boys while the middle one was left uninjured. Richmond, Va., 13th, about eight miles from town a large tree was set on fire by electricity, and a shell which was lodged in the tree during the late war was exploded thereby with a deafening report. Carr Station, Col., 16th, a cow boy while riding his horse to seek shelter from the storm was instantly killed; his body was terribly disfigured and burned; the horse had its head split open and brains scattered about, while the remainder of the body was badly mangled; all the metallic portions of the saddle and bridle were burned off. On New York Bay, 15th, a small fishing schooner containing two ladies and one gentleman, had its mast shattered to splinters down to the step, without doing the slightest injury to the hull of the boat or its occupants; the heads of the ladies were within one foot of the mast when struck. Grafton, Ohio, 31st, in passing through the roof of a residence near one of its chimneys the electricity entered a room below where two little girls were playing. It struck one of them on the head and passed down the right side of her face and over her breast to her knees, leaving a mark about two inches wide and completely stripping off her clothing, which was torn into shreds; the child was instantly killed while her companion remained uninjured. Saugus, Essex Co., Mass., 21st, electricity entered the telegraph office upon a wire connected with the instruments, burning off the connections and completely destroying one of the wires; a lady who sat about two feet distant from the instrument table, copying a message, had her pen and penholder melted in her hand, the paper was scorched, the carpet burned, torn up and blackened and the room filled with smoke; there were several sharp cracking explosions, which were heard a considerable distance; the lady experienced no sensation, except a slight pain in her side nearest to the instruments, otherwise she was perfectly uninjured; the walls of the house were scorched and